tory sketch of the present state of our knowledge of terrestrial vulcanicity," &c., is far from being such, and in greater part but a one-sided exposition of Mr. Mallet's own views of what he terms vulcanicity and vulcanology, and which, to quote one of his reviewers, "has really no connection with Palmieri's report."

It is unnecessary here to occupy space in splitting hairs over the exact definition of words, such as theory, hypothesis, force, &c., being quite content to assume that the readers of NATURE fully understood the sense in which I employed them; but when the abstracts published in the "Proceedings of the Royal Society" are generally admitted to be faithful reports of the main features of the Memoirs read before the Society, and here it is not a question of details, I ask any rational individual whether Mr. Mallet, merely because he considers the abstract of his paper as "most meagre and incomplete," is justified in using such words (p. 382) as "Mr. Forbes commences with an important error as to a matter of fact, by referring to 'Mr. Mallet's Dynamical Theory of Volcanic Energy,' as published in the Proceedings of the Royal Society for 1872."

When an author commits himself to print, he should also be prepared for the consequences; yet the tone of Mr. Mallet's critique evidently indicates extreme irritation in finding his views commented upon before his communication to the Royal Society is published in full, explaining in other words, that before this is done nothing is known about them—a state of things eminently suggestive, both that the scientific men who, he is pleased to inform us, have already expressed themselves in his favour, may, after all, have been somewhat hasty in so doing, and also that Mr. Mallet would have been more wise if he had withheld his self-laudatory sketch until the publication of the evidence in favour of his views had afforded the scientific world the opportunity of forming a mature judgment as to their soundness.

Volcanic rocks, or rather rock species, are commonly arranged under the two classes, Trachytic and Pyroxenic, names proposed by Bunsen as the equivalents of acid and basic, and it is hardly necessary to observe that when the mineralogical and chemical natures of rocks are to be compared, some such classification must be taken into account, since it would be as absurd to liken a trachytic to a pyroxenic rock as chalk to cheese; it must also be remembered that the same volcanic cone may emit lavas of both these classes, a fact observed by the Scientific Commission at the eruption of Santorin, when in exactly similar manner to many ancient outbursts, the trachytic preceded the subsequent and more abundant pyroxenic lavas. As regards the mineralogical and chemical constitution of unaltered volcanic rocks, nothing is more certain than that from whatever part of the world they proceed, they are essentially made up of a very limited number of mineral species, always the same, and the application of the microscope to petrology has now proved this to be the case also, when they are of so compact a texture as not to admit of their constituent minerals being distinguished by the naked eye. The examination of any large collection of volcanic rocks cannot fail to impress the observer with the wonderful similarity of the various rock specimens from one volcano to corresponding ones from others situated at the greatest distances; and ample evidence of this may be seen in the writer's extensive collection, the result of many years' labours in the volcanic districts of Europe, America, Australasia, and Africa, and in which, for example, specimens may be seen of trachytes from Auvergne, the Rhine, or the Andes, undistinguishable from one another when placed side by side, other lavas from Otaheite (where, however, Pele's hair is not found, as mentioned by Mr. Mallet), to all appearance identical with those from Etna, both of which volcanic districts he has had good opportunities for studying.

Pele's hair, from Hawai, in the Sandwich Islands, so called from its having been blown by the action of the winds over the surface of the molten lava into hairlike filaments resembling spun glass, is simply pyroxene, a mineral which, next to felspar, is the most common constituent of the lavas of all volcanos.

When, however, Mr. Mallet asks, "Are the ancient basalts and trachytes identical with the modern ones or with each other in different localities?" the answer to the first question is simply no, for the results of modern petrological inquiry tend to show, although no sharp line can be drawn, that the volcanic rocks which made their appearance in the successive stages through which our globe has passed, although more or less characteristic of the epoch, were analogous to, but not absolutely identical with, those which either preceded or succeeded them; and to the second question the reply is, that they are identical in mineralogical and chemical constitution, and often even approximate closely in percentage composition.

The well-known researches of Bunsen on the volcanic rocks of Iceland, followed up by those of Abich on those of the Caucasus, showed the simplicity and identity in chemical constitution of volcanic rocks, and the later results of trustworthy chemical analyses, not of fragments chipped off at random, but of such as represent the mass of the unaltered rock itself, are every day bringing forward more complete evidence of this being the case; this is, without doubt, well understood by Professor Palmieri, for the very words cited by Mr. Mallet, in which he mentions that "two specimens of the same lava appear indeed to have their constituents in different proportions" are qualified by stating that the observatory did not possess the means of arriving "at any conclusion" on this point, and by expressing the hope that Prof. Fuchs, who had specially devoted himself to this subject, would, by employing "well selected and sufficiently large specimens," obtain satisfactory results. Not only do all chemists and mineralogists know that there may exist a considerable difference in the percentage composition of mineral species which are of identical chemical constitution, but in answer to Mr. Mallet's questions as to iron blast-furnace slags, every scientific metallurgist will admit that the basis of good smelting, necessitates the production of slags having a constant and definite chemical constitution, and that not only should the slag from every two tappings be identical in this respect, but that so long as the furnace works properly, and the same materials are charged into its mouth, the same slag will also flow from its hearth; many years' practical experience in the management of blast-furnaces, and the numerous analyses of slags which I have made, some of which will be found published as far back as 1846 in the British Association reports on the crystalline slags, have not only fully satisfied me on this point, but shown me examples of iron blast-furnaces, which, from their having been constantly fed with precisely the same ore, fuel, and flux, have not only for successive tappings, but for years, produced slags, not only identical in chemical constitution, but in which the percentage of the constituent silica and bases have only varied within extremely small limits.

When Mr. Mallet, however, asks such questions as whether the *crystalline* minerals of volcanic rocks are identical, and furnishes in his critique the most ample evidence of his confounding chemical constitution with percentage composition, ignoring altogether the laws of isomorphism and the substitution of bases, I believe mineralogists will absolve me from taking up more space in discussing further these questions. The implication of being unacquainted with the works of von Waltershausen, Senft, Blum, and my good friend Zirkel, which have been in my hands, I might almost say warm from the press, is easily disposed of, as numerous references will be found to them in my published papers; curiously enough, not long back I referred in a paper to opinions of von Waltershausen which are diametrically opposed to those held by Mr. Mallet; in the *Geological Magazine* for 1867, p. 227, references will be found to the other three works. If Mr. Mallet's knowledge of recent petrology is based upon "Blum's Handbuch der Lithologie," which he recommends "above all," I would remind him that this work, although a very excellent one when it was written in 1859, is now quite antiquated, this branch of mineralogical science being then, as it were, only in its cradle as compared to the great advances which have been made during the last eight or ten years: "von Waltershausen vulkanische Gesteine" appeared still earlier, in 1853.

I would remark that neither in this communication, nor in my review, was it the intention to take into consideration Mr. Mallet's theory of volcanic energy, and it was only alluded to because, in his introductory sketch, he so altogether overlooked those explanations which, notwithstanding his reply, will still be demanded by chemists, mineralogists, and geologists, before they can accept his views; I still object most strongly to the tone and style of his introductory sketch, and I am not alone in doing so.

Thornton Cottage, Aug 8. DAVID FORBES

---

## Explosion of Chlorine and Hydrogen

SOME time ago, being desirous of showing a class the explosion of chlorine and hydrogen by artificial light, I devised a simple method which was perfectly successful. Equal volumes of the two gases, prepared separately by the usual methods, were

© 1873 Nature Publishing Group

mixed in a stout test tube and confined by a greased cork. This was placed upright on a little wooden stand, and kept in its place by a brass clip. About an inch of magnesium ribbon was suspended in a small tin shade by means of a wire clip. The magnesium being placed near the tube and lighted, the gases united with a report, jerking the cork to the ceiling, but in no case breaking the tube.
W.

## *A NEW BUBALE, FROM ABYSSINIA*

THE British Museum has just received a series of skins of a new Bubale from Abyssinia called Tora. It is like the Hartibeest for having a white patch on the rump, and white inside the ears, but it is without any black on the face or on the outer side of the limbs. It is of a bright pale bay colour, with black tuft on the tail, and the horns are much more slender than in the Hartibeest. I propose to call it *Alcephalus tora.*

J. E. GREY

## *FROM AMERICA TO ENGLAND BY BALLOON*

THERE appears every likelihood that before the end of the year a feat will be attempted which seems to have been first seriously proposed thirty years ago by Prof. Wise, an American aëronaut, who is now making preparations to cross the Atlantic to England in a monster balloon. The American correspondent of the *Standard* has given full details of the elaborate construction of this balloon, and states the reasons which inspire Prof. Wise with unhesitating confidence that he will be able successfully to accomplish his aërial voyage.

The balloon, when completed, will be 160 ft. high, and the globe will be over 100 ft. in diameter. It will be able to lift from the ground, including its own weight, 14,000 pounds, and will have a net carrying capacity for passengers and ballast of 6,900 pounds. It will contain 600,000 cubic feet of illuminating gas, though only 400,000 feet will be put into it to allow for expansion in the higher regions of the atmosphere. The other details of construction are most elaborate, and every precaution seems to be taken to insure success and to provide for the safety of the four persons who are bold enough to risk their lives to gratify their curiosity and endeavour to increase the sum of human knowledge. The four voyagers will be Prof. Wise, Mr. Donaldson, an agent of the *Daily Graphic*, and a skilled mariner—for a copper-fastened cedar life-boat, 22 ft. long and 4½ ft. beam, forms part of the appurtenances.

The hypothesis on which the enterprise is projected, is that there is a prevailing east-going current of air at an attainable elevation, in which a balloon can pass eastward from the American continent to Europe. The current is believed to be half-a-mile or more above the surface of the earth, and to move at the rate of from 50 to 150 miles an hour. It was a knowledge of this current that made Mr. Charles Green, the celebrated English aëronaut, say, in 1840, that he should start from America rather than from England to traverse the Atlantic in a balloon. The cause of the current is less definitely known than the fact. A French *savant* attributes it to "a decrease of participation in the rapidity of the rotary motion of the earth." Prof. Wise believes that this upper current of air, in the temperate zones, moves from west to east, because of the mingling of the south-west and north-west trade-winds in their circuits, in accordance with the laws of temperature and the aërial motion of the earth. The two currents, he believes, slide over each other, and the balloonist who knows his business can strike such a point as will carry him eastward, as it were, between them. That is to say, the zone lying between the 35th and 36th parallels is "a nodal zone," in which the south-west and north-west winds induce an intermediate current which moves nearly due east. In this highway the motion is about a hundred miles an hour.

The theory of the east-going current seems to be pretty well admitted. The direct experience which bears most strongly upon it is limited. There are three memorable balloon trips which are noteworthy. The current seems to set persistently eastward, deflected slightly towards the north by the rush of equatorial air towards the north. Prof. Wise, in 1859, in his trip from St. Louis to Jefferson county, in the State of New York, found the current almost due east; he travelled in balloon 1,156 miles in 19 hours. The speed here was only 61 miles an hour; but this can be accounted for. The great balloon voyage made by Nadar from Paris to Hanover was almost due eastward. This journey of 600 miles was made in about six hours—about a hundred miles an hour, although it was over the uneven surface of the Continent, diversified by hill, vale, stream, and so on. In the trip of Mr. Green, from London to Wellburg, in Nassau, the journey was about 600 miles, and was performed at the rate of about a hundred miles an hour, and there were the British Channel and other irregularities in the way of smooth sailing.

On the other hand, however, Mr. Glaisher in his experiments, in consequence of what Mr. Green had stated with regard to the constant prevalence of a current from the west, paid special attention to this point, and in his reports to the British Association in 1863 and 1864,* collected together the different directions in which the balloon had moved at different heights in his several ascents. From these it appears that the direction of the wind was quite as capricious at heights exceeding 5,000 ft. as it is on the surface of the earth. In Mr. Glaisher's winter ascents he did generally meet with a current from the south-west, certainly; but the number of such ascents was not great, and they were not to sufficient elevations to afford very trustworthy results. It is certain, however, that if there existed over England anything like a current of air constant in direction, it must have manifested itself distinctly in the course of Mr. Glaisher's thirty ascents, in all of which the direction of the wind at different elevations was a subject of careful observation.

Again, Prof. Newton of Yale College has written a letter to a recent number of the *Daily Graphic*, in which, from the observed behaviour of the luminous trains sometimes left by the brighter meteors at from forty to seventy miles high, he draws certain inferences which do not seem altogether favourable to Prof. Wise's theories. What these inferences are will be seen from the conclusion of his letter:—

"We have, then, at the *bottom* of the atmosphere, inconstant winds. We have just above us strata of air moving in diverse directions, for the lower clouds may move one way, the upper clouds another, while at the surface the winds may perhaps blow in a third. At two islands at short distances from each other we often have different winds.

"Again, we have for air near the top of the atmosphere, at least so high up that the density is exceedingly small, this fact, that lines (usually inclined to the horizon) only five or ten miles long almost always have their ends in air that is moving in different directions.

"Between the highest cloud and the lowest meteor trains lies an unknown region. It may be that here are uniform westerly winds. In the absence of direct observation neither this nor the contrary may be asserted. But it seems to me more rational to suppose that the complex system of currents at the bottom of the atmosphere is in direct connection with that at the top, and that there is a like complex system of currents and winds throughout the intermediate space. Of course, the general drifting of the air in the temperate zone to the east is unquestioned.

Prof. Joseph Henry, of the Smithsonian Institution,

---

* British Association Reports, 1863, p. 507, and 1864, p. 313.

© 1873 Nature Publishing Group